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Preventing Hepatitis B and Hepatitis C Virus Infections in End-Stage Renal Disease Patients: Back To Basics

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In this issue of HEPATOLOGY, Mathurin et al. report the results of a 10-year retrospective study of kidney transplant recipients that compared rates of patient and graft survival among patients with and without chronic hepatitis B virus (HBV) or hepatitis C virus (HCV) infection.¹ Following this cohort of patients at intervals of 5 and 10 years, the investigators found a statistically significant decrease in survival in the HBV-infected group at both 5 and 10 years and a similar decrease at 10 years in the HCV-infected group. The findings of this study underscore the importance of preventing these infections in end-stage renal disease patients.

End-stage renal disease patients on chronic hemodialysis are at risk for both HBV and HCV infection.^{2,3} HBV is the most efficiently transmitted blood-borne virus in the hemodialysis setting. Outbreak investigations and other studies have consistently shown that risk factors associated with HBV transmission among hemodialysis patients include the presence of a chronically infected patient; failure to separate that patient by room, machine, and staff; and failure to vaccinate patients against hepatitis B.⁴⁻⁶ After the 1977 publication of specific infection control practices for controlling HBV infection in chronic hemodialysis units (i.e., hemodialysis unit precautions),⁷ the incidence of HBV infections in these patients decreased dramatically.^{4,5} These practices included (1) monthly serological testing for hepatitis B surface antigen (HBsAg) of all susceptible patients and prompt review of results; (2) glove use whenever patients or hemodialysis equipment are touched; (3) the assignment of specific nondisposable items to individual patients so that no sharing of instruments, medications, and supplies between any patients occurred, regardless of serological status; and (4) separation of clean and contaminated areas, such that handling and storage of medications and hand washing are not done in the same or an adjacent area to that where blood samples or used equipment are handled. Other routine precautions recommended for all hemodialysis patients included the assignment of patients to specific dialysis stations and cleaning or disinfecting nondisposable items and environmental surfaces between uses. In addition, the recommended precautions for

HBsAg-positive patients required the physical separation of these patients from susceptible patients and the cohorting of separate dialysis machines, instruments, supplies, and staff to HBsAg-positive patients.

In 1982, hepatitis B vaccination was recommended for all susceptible patients and staff in hemodialysis units.² Although hepatitis B vaccination produces lower immunogenicity rates in hemodialysis patients than in healthy persons, half or more of hemodialysis patients can be protected from hepatitis B by vaccination, and maintaining immunity among these patients reduces the frequency and costs of serological screening.^{2,8} Higher rates of protection can be achieved by vaccinating end-stage renal disease patients before they begin dialysis.⁹

Despite the success of long-standing infection control practices for preventing HBV infections among chronic hemodialysis patients, HBV transmission in this setting remains problematic. Recently, five hepatitis B outbreaks in chronic hemodialysis units were reported during 1 year in the United States.¹⁰ Investigations indicated that all resulted from failure to use recommended infection control practices, including failure to routinely screen patients for HBsAg or routinely review results of testing to detect infected patients; assignment of staff to the simultaneous care of infected and susceptible patients; and sharing of supplies, particularly multidose medication vials, among patients. In addition, few patients in these units had received hepatitis B vaccine, and overall, only 36% of patients in the United States have ever received the vaccine.⁵

It is not clear why, after 20 years of successful implementation of infection control strategies in the hemodialysis setting that resulted in the near eradication of new HBV infections among patients and staff, these strategies are no longer fully, or universally implemented. Changes in staffing patterns, downsizing of staff, and lack of knowledge or understanding of appropriate infection control practices and the merits of vaccination in this setting might all be contributing factors.¹¹ Alternatively, the emphasis on "universal precautions" (now referred to as standard precautions) in the mid 1980s might have caused hemodialysis staff to focus only on barrier precautions for preventing transmission, whereas the precautions unique to the hemodialysis environment that are essential for preventing patient-to-patient transmission of HBV and other blood-borne pathogens in this setting were minimized or forgotten.

Standard precautions focus on barrier precautions to prevent exposure to blood-borne pathogens, and include directions for hand washing after touching blood and other potentially infectious material, the wearing of gloves when touching blood or other potentially infectious material, and the wearing of face shields and gowns when exposure to

Abbreviations: HBV, hepatitis B virus; HCV, hepatitis C virus; HBsAg, hepatitis B surface antigen.

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Received November 3, 1998; accepted November 17, 1998.

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blood or body fluids was anticipated. Standard precautions do not restrict the use of supplies, instruments, and medications to a single patient. Routine precautions for hemodialysis units are more stringent than standard precautions.

Routine hemodialysis unit precautions, regardless of patients' serological status, require glove use whenever patients or hemodialysis equipment are touched and specify that no supplies, instruments, or medications be shared between any patients, including ancillary supply equipment such as trays, blood pressure cuffs, clamps, scissors and other nondisposable items. Other precautions specific to the hemodialysis environment include preparing and distributing medications from a centralized area and not using common medication and supply carts so that the practice of sharing of medications and supplies is eliminated.

Routine hemodialysis unit precautions should be sufficient for preventing transmission of HBV among hemodialysis patients, when such practices are routinely and rigorously performed. Unfortunately, such is not the case in many hemodialysis units, as shown by recent outbreaks of HBV infection. In most instances, "minor" breaks in infection control practices will not result in blood-borne pathogen transmission, because the pathogens might not be present, the dose might be insufficient to result in infection, or the pathogens do not survive on environmental surfaces. However, HBV circulates at extraordinarily high titers and remains stable on environmental surfaces for long periods of time,^{12,13} thus, even "minor" accidental breaks in infection control practices can result in HBV transmission among patients. Therefore, the additional precautions for HBsAg-positive patients as noted previously, in combination with hepatitis B vaccination, remain necessary for the continuing and successful prevention of HBV transmission in chronic hemodialysis settings.

The transmission of HCV infection among chronic hemodialysis patients also might be related to failure to follow routine hemodialysis unit precautions. Prevalence of antibody to HCV (anti-HCV) among chronic hemodialysis patients averages 10%, with some units reporting rates greater than 60%.⁵ Risk factors for HCV infection among hemodialysis patients have included history of blood transfusion, volume of blood transfused, years on dialysis, and injection drug use.^{3,14-16} Current screening and testing practices for blood donors have reduced the threat associated with transfusions to negligible numbers. Increasing years on dialysis has been the risk factor most consistently reported as being independently associated with higher rates of HCV infection. As the number of years patients were on dialysis increased, their prevalence of HCV infection increased from an average of 12% to an average of 37%.³ This relationship was found even for patients with no history of blood transfusion or injecting drug use, suggesting that HCV might be transmitted between patients in the hemodialysis setting. Further evidence for such transmission can be derived from incidence studies and outbreak investigations.^{15,16} In one study, an annual incidence of approximately 3% was observed, and none of the patients who seroconverted had received transfusions or were injecting drug users.¹⁵

As with HBV, we believe that transmission of HCV among hemodialysis patients results from apparent lack of awareness or understanding by current hemodialysis staff of the differ-

ences between standard precautions and routine hemodialysis unit precautions. Unlike HBV, however, additional precautions (*i.e.*, routine testing and cohorting) to prevent HCV transmission are not necessary. When followed routinely, hemodialysis unit precautions should be sufficient for preventing HCV transmission by preventing patients' exposure to blood-contaminated supplies, instruments, medication vials, equipment, and hands of personnel. Periodic HCV testing for infection control purposes currently is not recommended, and isolation of HCV-positive hemodialysis patients is not necessary. However, current guidelines do recommend HCV testing for persons most likely to be infected with HCV including chronic hemodialysis patients.¹⁷ Such testing provides the opportunity for appropriate medical management and prevention counseling for HCV-infected persons.

The study by Mathurin et al. indicates that infection with HBV or HCV significantly reduces the chances of survival for renal transplant recipients. If we consider that at least some of these patients contracted their infections during time spent in hemodialysis units, then we have to admit our failure at not having adequately protected them from these preventable diseases. Individuals responsible for the care of chronic hemodialysis patients should reacquaint themselves with the recommendations for preventing blood-borne pathogen transmission in this setting and ensure that they are performed.

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